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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,417	02/10/2004	Yoshiki Nishibayashi	50212-559	1031
7590 McDermott, Will & Emery 600 13th Street, N.W. Washington, DC 20005-3096				
EXAMINER				
OLSEN, ALLAN W				
ART UNIT		PAPER NUMBER		
1792				
MAIL DATE		DELIVERY MODE		
02/20/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/774,417

**Applicant(s)**

NISHIBAYASHI ET AL.

**Examiner**

Allan Olsen

**Art Unit**

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claims 1,3,4,12,14-16 and 19-23 are pending in the application.
- 4a) Of the above claims 15 is withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claims 1,3,4,12,14,16 and 19-23 are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim 15 is subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 May 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 09/995,854.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

As noted in the Office action of June 23, 2008, claim 15 is withdrawn from consideration as claim 15 is directed to an invention that is independent or distinct from the invention originally claimed.

### ***Response to Arguments***

Applicant's arguments filed November 24, 2008 have been fully considered but they are not persuasive.

Applicant argues that the applied references fail to teach monitoring the ratio between the intensity of atomic oxygen and molecular oxygen emissions.

The examiner notes that the "wherein" clause of claim 1 does positively recite method steps and the condition set forth in the wherein clause are considered to be inherent in a method that uses the same etching conditions. As noted in the telephone interview of February 12, 2009, the rejection could be overcome if applicant were to amend the claims to positively recite method steps that pertain to the elements of the wherein clause.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1, 3, 4, 12, 14, 16 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the paper by Shiomi, "High-Rate Reactive Ion Etching of Diamond and Fabrication of Porous Diamond for Field-Emission Cathode", in New Diamond, Vol. 13, No 4. pp 28-29, in view of US Patent 6,261,726 issued to Brooks et al. and further in view of US Patent 6,013,191 issued to Nasser-Faili et al. (hereinafter, Shiomi, Brooks and Nasser-Faili, respectively).**

Shiomi teaches the reactive ion etching of a masked diamond surface. Shiomi teaches the mask comprises aluminum (page 2, line 17 of translation). Shiomi teaches that diamond is etched by a plasma of 100% O<sub>2</sub>. Shiomi teaches that the plasma may alternatively comprise NO<sub>2</sub> or N<sub>2</sub>. Shiomi teaches that the angle of the sidewall can be controlled by adding CF<sub>4</sub> to the etchant. Shiomi teaches that vertical sidewalls can be obtained by adding a very small amount of CF<sub>4</sub>. Shiomi teaches using a CF<sub>4</sub> concentration as low as 0.125% (page 5, line 2).

With respect to independent claims 1 and 12, Shiomi does not teach supplying less than 1.0 W/cm<sup>2</sup> of power to the RIE process. With respect to independent claims 17 and 18, Shiomi does not teach supplying at least 0.45 W/cm<sup>2</sup> of power to the RIE process. Shiomi does not teach using a both O<sub>2</sub> and N<sub>2</sub> in the plasma gas.

Brooks teaches etching diamond with a mixture of O<sub>2</sub> and N<sub>2</sub> (see col 6, line 63).

Nasser-Faili teaches etching diamond within various types of plasma chambers and under a variety of process conditions. Nasser-Faili teaches using a power density of "about 1 W/cm<sup>2</sup>" which encompasses the claimed "less than 1.0 W/cm<sup>2</sup>" and the claimed "at least 0.45 W/cm<sup>2</sup>".

It would have been obvious to one skilled in the art to etch diamond with plasma comprising O<sub>2</sub> and N<sub>2</sub> and a fluorine-containing compound because Shiomi teaches using either O<sub>2</sub> or N<sub>2</sub> and "[i]t is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the very same purpose."<sup>1</sup> Furthermore, because Shiomi teaches etching diamond with an O<sub>2</sub> plasma while Brooks teaches etching diamond with an O<sub>2</sub>/N<sub>2</sub> plasma, a person having ordinary skill in the art would recognize an O<sub>2</sub> plasma and an O<sub>2</sub>/N<sub>2</sub> plasma as being functionally equivalent with respect to the etching of diamond. Furthermore, it would have been obvious to use N<sub>2</sub> in an amount between, the claimed 2.5 % and 40 % because Shiomi teaches that 100% O<sub>2</sub> etches diamond, therefore, one skilled in the art would view N<sub>2</sub> as an additive and would not be expected to use N<sub>2</sub> as the major component over the O<sub>2</sub> etchant. As such, it would be obvious to use less N<sub>2</sub> than O<sub>2</sub> (i.e., between ~1% and 50%).

It would have been obvious to one skilled in the art to add fluorine to the O<sub>2</sub>/N<sub>2</sub> mixture of Brooks because Shiomi teaches that the addition of fluorine allows one to gain control over the etching profile. Additionally, in view of Nasser-Faili's teaching, the skilled artisan would have reasonable expectation of success because Nasser-Faili demonstrates the etching of diamond with plasma comprising oxygen, nitrogen and a low fluorine content.

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<sup>1</sup> *In re Kerkhoven* 205 USPQ 1069 (CCPA 1980). Cites *In re Susi* 169 USPQ 423, 426 (CCPA 1971); *In re Crockett* 126 USPQ 186, 188 (CCPA 1960). See also *Ex parte Quadranti* 25 USPQ 2d 1071 (BPAI 1992).

It would have been obvious to one skilled in the art to apply power with a power density of least  $0.45 \text{ W/cm}^2$  because Nasser-Faili teaches that by supplying  $1.5 \text{ W/cm}^2$  of power, one can obtain vertical structures similar to those obtained taught by Shiomi.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M, W and F: 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1792

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Allan Olsen/  
Primary Examiner, Art Unit 1792